

Visting the Laboratory

School Tours for local Tri-Valley 4th and 5th grade classes are available October through May. The half-day morning tour includes a visit to the Discovery Center and an interactive, hands-on "Fun with Science" program. For more information or to schedule a school tour, call (925) 423-3272.

The Discovery Center provides visitors with a window into the Laboratory's research programs, computations capabilities and experimental tools. Here you'll experience a broad-based display of our science and technology, as well as highlights of the Laboratory's history.

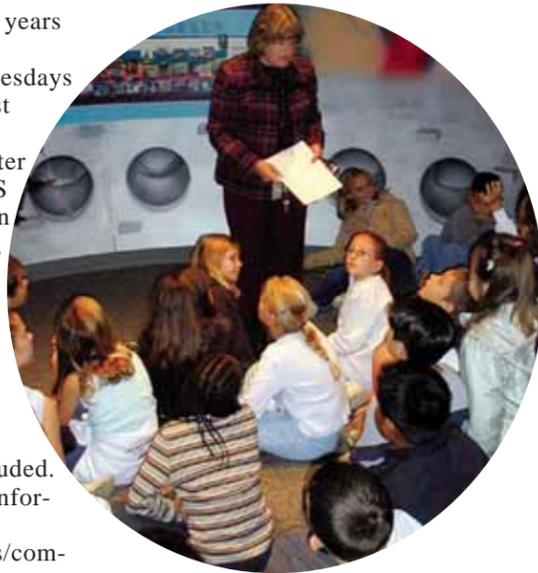
Community Tours of the Laboratory offer visitors a view into some of our exciting state-of-the-art research programs and facilities. Tour

participants must be at least 18 years of age.

Tours are conducted on Tuesdays and Thursdays at 9 a.m. and last approximately two hours.

U.S. citizens need to register two weeks in advance. Non-US citizens must register 60 days in advance. For more information, call (925) 424-6575.

Located off Greenville Road at East Gate Drive in Livermore, the Discovery Center is open to the public Monday through Friday, 1 - 4 p.m. and on Saturdays from 10 a.m. - 2 p.m. Lab holidays excluded. Call (925) 423-3272 for more information or go the Web at <http://www.llnl.gov/llnl/06news/community.html>.



Word search Olympics

Find the following words in the word search below. The words may appear backwards, forwards, diagonally, across or up and down.

If you can find all 12 words, you will win the Olympic GOLD.

D G V C Q G M E S I Q L
 R I R K R A V I T N P L
 T C S E Y R V R A V Z L
 M H E C E R I P T E N K
 I K E S O A T Q I N O V
 R X B O N V E E C T I S
 W O D G R G E N M I T Q
 N L L H N Y R R X O S L
 S E H T A M H P Y N E X
 E N I C I D E M A I U G
 S C I E N C E W J B Q E
 J R T P C U W J R O E P

If you can find all 12 words, you will win the Olympic GOLD.

DISCOVERY	OBSERVE	GEOMETRY
QUESTION	GREEK	SCIENCE
INVENTION	STATIC	MATH

Super Science is a publication of the Public Affairs Office at Lawrence Livermore National Laboratory.

If you would like to be included in the distribution of Super Science, please contact Linda Lucchetti, lucchetti1@llnl.gov, or call (925) 422-5815

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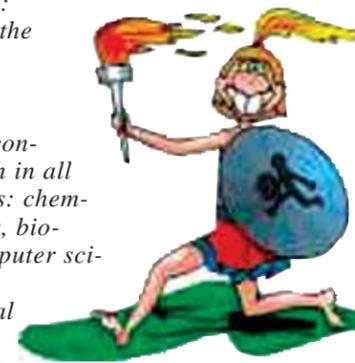


Greeks score a perfect '10'

Editor's note: Scientists at the Lawrence Livermore National Laboratory conduct research in all science areas: chemistry, physics, bio-science, computer science and environmental science.

But they would not be successful in their research if it weren't for the many laws, theories and accomplishments made by ancient Greek scientists who paved the way for modern discoveries.

In honor of this year's Olympics held in Greece, this issue of LLNL's "Super Science Newsletter" is dedicated to the ancient Greeks who cultivated excellence in math, medicine and science. Without them, many of the basic elements of algebra, astronomy and pediatrics would not exist.



Did you watch the Summer Olympics on television? They were held this August in Athens, Greece, where the idea for the very first Olympic games was born. Not only were the ancient Greeks interested in athletics, they were also very interested in science and math. They were seeking a way of organizing the world, making order out of our disorder, and having power over some very powerful things like oceans and weather.

The Greek culture laid the ground work for the growth of philosophy, sports and science. They influenced everyone around them.

The ancient Greeks made much possible; they opened many doors. Throughout the time of ancient Greece, there was one common theme: a quest for learning. This was a time to seek knowledge; a time to ask questions and find the answers. It was a time of inspiration and experimentation, and to challenge what had been said for years.

Were it not for the ancient Greeks, many of our modern scientific achievements would not be possible. Imagine that!

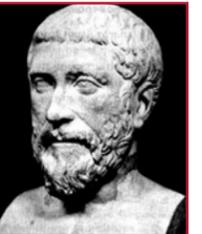
Breaking news

Those Greek scientists were hard at work

Here are just a few of the ancient Greek scientists who helped pave the way for the modern science of today.

Pythagoras - the Father of Geometry

From about 600 B.C., many Greeks spent time observing the planets and the sun and figuring out how astronomy worked. By the 400s B.C., Pythagoras, who lived in Greece and Southern Italy, was interested in philosophy and mathematics. You might say that he was the father of geometry.



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Greeks, inventors of new devices, methods

The Greeks were responsible for many inventions of ancient times. Around 330 B.C., the Greeks invented a device called a clepsydra, which measured time by the flow of water. The water clock works because liquids flow at a constant rate out of a small hole; the drops of water occur at a known rate. Although the water clock was not the best way to tell time, it was centuries before more accurate ways to measure time were invented.

The Scientific Method - helping scientists organize their findings

The Greek philosopher Socrates developed logical methods for deciding whether something was true or not. And in the 300s B.C., Aristotle and other philosophers at the Lyceum and the Academy in Athens worked on observing plants and animals, organizing them into types. They were trying to put order into the world around them. Did you know that the

Greeks invented the Scientific Method?

You may have heard of and used the Scientific Method. It is a series of steps used to help scientists organize their findings and solve a science problem. You can use the Scientific Method on any experiment. You may have used this when

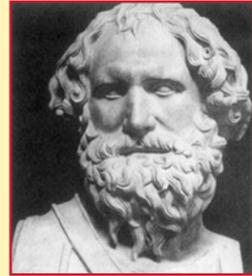
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Greek scientists at work

Archimedes – he came clean with a discovery

Scientists come up with ideas and theories at the oddest times.

Take Greek scientist Archimedes, for example. It is said that he discovered a famous scientific principal while taking a bath. You see, he noticed that when he lowered his body into a bathtub filled to the top with water, the weight of the water



Archimedes

of water equal to his own weight.

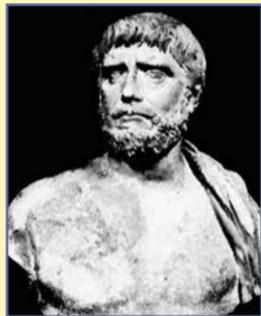
Upon realizing this, he jumped up and yelled “Eureka!” which in Greek means, “I got it!”

Archimedes is known for the Archimedes’ principle. This states that an object immersed in liquid displaces an amount

of water equal to its volume (density).

Thales: He witnessed attraction in action

In 600 B.C. the Greek scientist Thales discovered that if he rubbed some tree sap against a piece of wool, he could actually pick up small particles of straw and twigs. At the time, he wasn’t sure what this attraction was. You can learn more about his discovery by doing a simple experiment.



Thales

small pieces. Then, rub a blown up balloon on a wool sweater. Hold the balloon near the pieces of paper. What happens?

Thales first witnessed this occurrence which was later called static electricity. But, it wasn’t until thousand of years later, that electricity as

we know it today, would be discovered.

Rip up a piece of paper into

Ptolemy: He looked to the sky

Ptolemy was descended from a Greek family, and lived in Egypt and was also a citizen of Rome.

Ptolemy was an astronomer, mathematician and geographer. He calculated the apparent motions of the planets, as they were known back then and explained the motions of the Sun, the Moon, and the five planets known in his time.

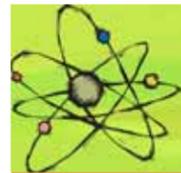


Ptolemy

He developed a system that came to be called the Ptolemaic System. This predicted the positions of the planets accurately enough for naked-eye observations.

Not just an astronomer, Ptolemy was also very important in the history of geography and

map making. He was truly one of the first scientists to know that the Earth is a sphere.



In-the-know

SUPERSCIENCE

What’s new in your neck of the woods?



Drop by the new Livermore Public Library.

Did you know that Livermore has a new public library? It is located at **1188 South Livermore Avenue.**

The building is new and spacious. And, there is a wonderful young people’s section full of books for students like you.

Stop by next time you’re in Livermore.

Learn about the Greeks and science
Here are some books available at

the Livermore Public Library that you might be interested in reading:

- *Science in Ancient Greece*, by Kathlyn Gay, New York: F. Watts, c1998
- *Scientists of the Ancient World*, by Margaret J. Anderson and Karen F. Stephenson, Springfield, NJ, Enslow Publishers, c1999
- *It’s about time! Science projects: how long does it take?* by Robert Gardner Berkeley Heights, N.J., Enslow Publishers, c2003

Scientists

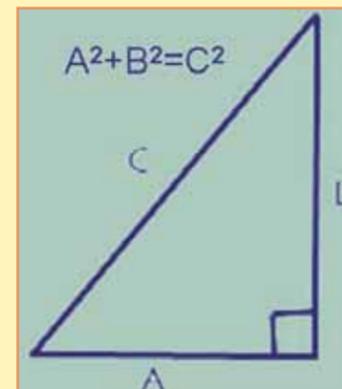
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try.

Pythagoras proved what is now called the “Pythagorean Theorem.” This states that in a right triangle, the sum of the squares of the two right angle sides

will always be the same as the square of the hypotenuse.

You may have not studied geometry yet, but to better understand this theorem, try proving it for yourself by measuring A and B in the diagram at right and adding to see if it equals C.



Inventors

Continued from page 1

developing a science fair project. Follow the steps listed below the next time you do

an experiment! *Note: Ideas for the section on ancient Greek scientists were taken from the book, “Ancient Science,” by Jim Wiese, John Wiley & Sons, Inc., New Jersey, 2003.*

The Scientific Method

This is a way to solve a scientific problem. Go over these steps with your teacher before starting an experiment.

1. Make an observation.

Is there a situation or observation that interests you and makes you wonder why or how?

2. Select a question.

What do I want to find out? This needs to be a specific question about a topic you will be able to observe and seek to answer.

3. State a hypothesis.

What do I think is going to happen? This is a prediction about what will happen as a result of your experiment. It could be the answer to your question.

4. Develop a procedure.

How will I set up my experiment? What supplies do I need? List every step you take to test your experiment.

5. Record the results.

What did I see, hear, feel? Write the date and time of each test. Record what happened after every test. Make detailed observations. Keep good notes.

6. State a conclusion.

What did I find out? Write what you think your data shows. Do your results agree with your hypothesis? Restate your hypothesis.

7. Record questions, observations and suggestions for future investigations.

Reflect on your investigation. Did your experiment cause you to think of other questions you want to answer?

Science mail bag

Here are some interesting questions from students who are studying the earth and water.

What percentage of the earth is water today?

Nearly 78 percent of the earth’s surface is covered with water today. The majority of that 78 percent is oceans.

Has this percentage changed?

This number has changed over time with the growth and melting of the polar ice sheets during and after the ice ages. At times the oceans were about 400 feet lower than today, exposing much more land surface. This happened when large quantities of water were locked up in glaciers. Today we are seeing a slow rise in the ocean levels, but scientists are not in agreement why. It could be due to global warming.

How many people are there on Earth?

The population of the earth is now around 5 billion people.

How much of the earth is salt water and how much is fresh?

The answer is 97.3 percent of all of the water on earth is saltwater. The remaining is fresh water, of which 2.1 percent is in glaciers and polar ice, 0.6 percent is underground water, 0.01 percent is in lakes and rivers and 0.001 percent is in the atmosphere. All of these percentages are very near approximations.

If you have science questions, ask your teacher to send them via e-mail to lucchetti1@lml.gov and we will publish the answers in our next Super Science Newsletter.